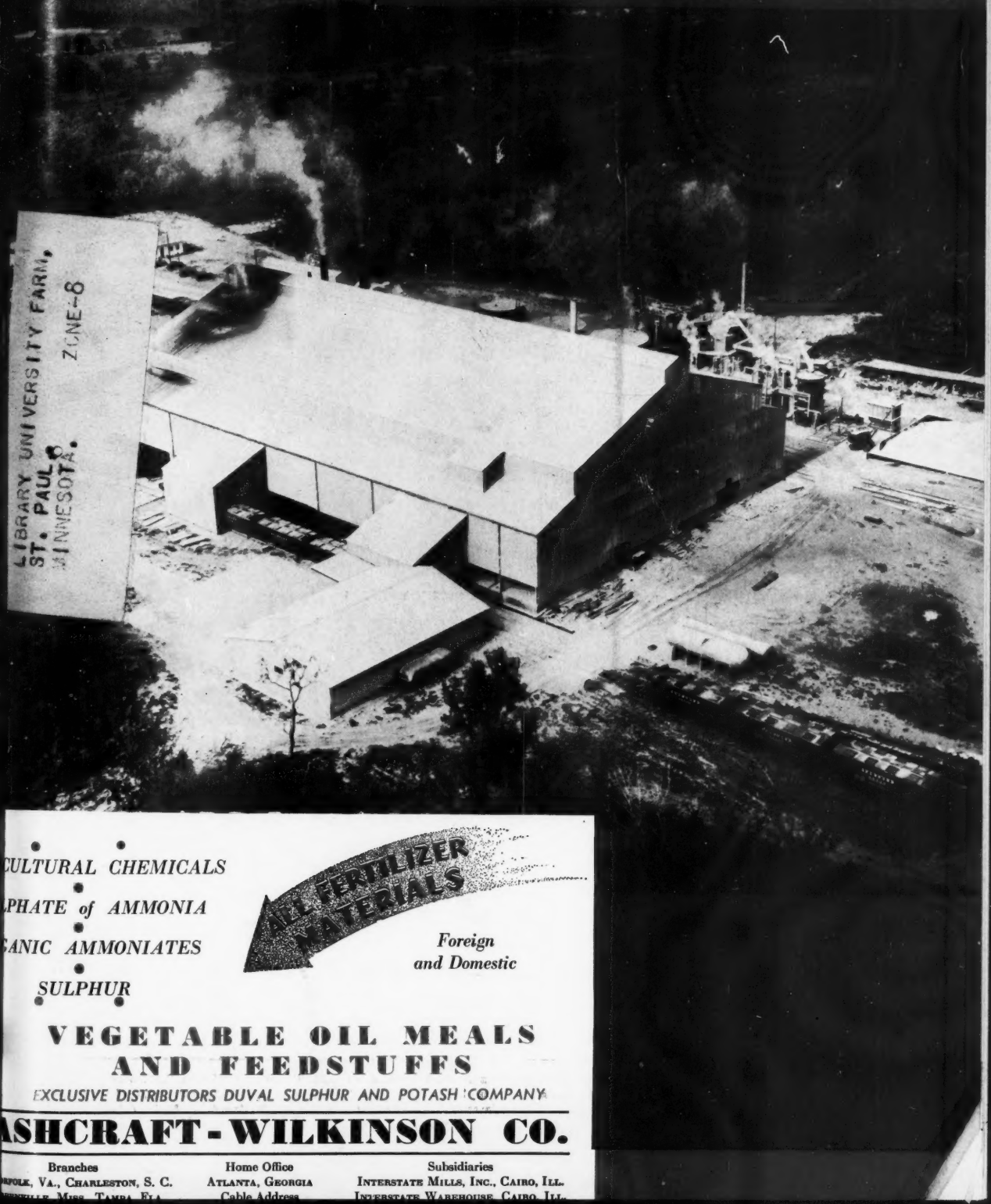
DECEMBER 23, 1950
VOL. 113 No. 13

AMERICAN FERTILIZER & ALLIED CHEMICALS



Published every other Saturday. Annual subscription: in the United States, 3.00; Canada and Mexico, 4.00; other countries, 5.00. Entered as second-class matter, January 15, 1910, at the Post Office at Philadelphia, Pa., under Act of March 3, 1879. Registered in United States Patent Office. Publication office, 317 N. Broad St., Phila. 7, Pa.

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AMERICAN FERTILIZER & ALLIED CHEMICALS

Established 1894

PIONEER JOURNAL OF THE FERTILIZER INDUSTRY

Published Every Other Saturday by

WARE BROS. COMPANY

317 NORTH BROAD STREET, PHILADELPHIA 7, PA.

Telephone: MArket 7-3405

A magazine international in scope and circulation devoted exclusively to the Commercial Fertilizer Industry and its Allied Industries

SAM LEWIS VEITCH, *Publisher*
A. A. WARE, *Editor*
A. M. BRODINE, *Associate Editor*
K. F. WARE, *Advertising Manager*

ANNUAL SUBSCRIPTION RATES

U. S. and its possessions, also Cuba and Panama . . . $3.00
Canada and Mexico . . . 4.00
Other Foreign Countries . . . 5.00
Single Copy 25
Back Numbers 50

AMERICAN FERTILIZER & ALLIED CHEMICALS *is not necessarily in accord with opinions expressed in contributed articles that appear in its columns*

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THE COVER: *With the tonnage of high-analysis fertilizers steadily increasing, the production of concentrated superphosphate is becoming more and more important. The manufacture of this material requires large investment outlay and careful process control. Our cover shows one of the most modern concentrated super plants, that of the Armour Fertilizer Works at Bartow, Fla.*

Operation Pestkiller

As a valuable by-product of World War II, we have come to a realization that seemingly insoluble problems can be solved by planned and coordinated effort. Each success of the Allied Armed Forces was possible only because there was first developed a comprehensive plan which used to the full the services of Army, Navy, Air Force, Service of Supply, Communications, Intelligence, Medical Service and the dozen or more other branches which compose the modern military set-up. Then with each section carrying out its assignment wholeheartedly and intelligently, victory was assured.

A demonstration of this same approach to problems of civilian and business life was given by the recent two-day meeting of the National Cotton Council of America at Memphis on December 7 and 8. In this instance, the enemy to be conquered was the insect horde which threatens the vitally important 1951 cotton crop. Cooperating in the formation of an integrated program of cotton insect control were the Bureau of Entomology and Plant Quarantine, federal and state Extension Services, experiment stations, land grant colleges, insecticide manufacturers, farm organizations and the cotton industry.

On the opening day, the nature of the crisis was outlined by officials of the Cotton Council, after which Ernest Hart, president of the National Agricultural Chemicals Association, and H. L. Haller, of the Bureau of Entomology and Plant Quarantine, discussed the insecticide supply outlook as it is being affected by the defense program.

On the second day, some specific problems were discussed, such as the most efficient use of weather forecasts as a guide to applying insecticides, and the way to stop the disastrous spread of the pink boll weevil.

At the closing session, a detailed guide for farmers in controlling cotton insects, such as boll weevil, bollworm, aphid, thrips and pink boll weevil, was presented and was commented upon by representatives from the several cotton-growing states.

The insecticides mentioned in the general recommendations included benzene hexachloride, calcium arsenate, toxaphene, aldrin and dieldrin. These materials—with the exception of calcium arsenate—were mentioned, either alone or in combination with other insecticides in both dust and spray materials. Calcium arsenate was among the recommended dusts.

Every farmer was urged to plan his control program as early as possible, with provision for alternatives if the desired materials are not available. Orders should be placed immediately, but purchases should be limited to actual needs—this is no time for hoarding or black market transactions.

With farmer, manufacturer, dealer and government scientist each carrying out his assignment in "Operation Pestkiller," the 16 per cent loss in the 1950 cotton crop from insect damage can be greatly reduced in the coming season.

SERVICE THROUGH RESEARCH

A Well-Known Soil Scientist Opens Up Avenues of Progress for The Fertilizer Industry*

By VINCENT SAUCHELLI

Director of Agricultural Research, The Davison Chemical Corporation, Baltimore, Maryland

WHAT IS RESEARCH? What do we understand by that concept? Research is regarded by many as a modern oracle. Everywhere you hear about research. The word is too much with us. It has different meanings for different people. To the simon-pure scientist it means pushing back the frontiers of fundamental knowledge. To the sales promotion manager it is too often so much frou-frou to garnish the advertising copy.

The dictionary defines the word as "a systematic study of certain phenomena by the experimental method." I prefer to think of research as a state of mind—a question mark state of mind. It is that state of mind which is willing to acknowledge that we do not know anything and have everything to learn about, let us say, fertilizers, plant nutrition, and the many mysterious phases of biological processes. Actually, we do not know the how and the why of plant growth—what makes the tiniest green alga "tick." But we should want to find out, if possible. That is the attitude which identifies the research mind and entitles the possessor to call his workshop or field plot a scientific laboratory. Research is thus the open mind with an honest desire to seek the truth.

We live in a pulsating, vibrant world of never-ending change. Scientific research is without doubt one of the most potent forces in American life impelling change. Research is not incidental to business; it is now considered a basic need of management. All over the land thousands of industrial laboratories employing a vast army of highly skilled scientists are busily engaged in pure and applied research. New and mighty industries are the sturdy children of this new creative power. Our own industry has felt the impact of this creative force and, despite the criticisms of the few, the plant food industry has made substantial progress in gearing itself into the chemical, engineering, and biological trends of the day. More about this later.

An industry is obliged to get a fresh growth, to renew its life force, or it will perish. When sales and profits are dropping, what do you do? Call in the field men, give them zippy, pep talks, or do you cut prices and sanction weasel concessions? Not so, I hope; for such have proved to be a snare and a delusion. Those remedies never did cure business anemia. No, modern business has learned that the real remedy is to discover and breed new business, improve the old, develop new products, and create new outlets. That is the scientific approach.

We in the fertilizer industry, therefore, have the obligation to work closely with all the agencies serving agriculture, more particularly with the plant breeder, the soil physicist, the biochemist, the plant physiologist and pathologist. By integrating our activities with theirs, we can the better achieve a prosperous, progressive agriculture in every community in which we serve. Thus, by creating new outlets—for example, fertilization of pastures—by developing new products—for example, concentrated potassium metaphosphates—by utilizing new crops—for example, safflower in Nebraska or sorghums in the Southwest—we create opportunities for increasing the use of fertilizers. Ours also is the obligation to speed the obsolescence of old dusty types of mixed fertilizers, inefficient equipment, and discredited sales policies. Does it make sense to keep any article or policy if we know of something better to replace it? Let us throw them on the scrap heap. That is not waste. It is waste if we cling too long to outmoded fertilizer plants, fertilizer grades, and, let me emphasize it again, to discredited sales methods.

The Research Team

Teamwork in research is the keynote of modern progress. The modern industrial research laboratory comprises a team and not a single man. This is the order of the day. We of the fertilizer industry must become one of a team. Farm problems are being studied from many viewpoints. Modern research programs comprise integrated production and sales phases: soil management, fertilizer ratios and crop rotations, and the grading and packaging of the farm product. To correlate these projects is not easy; but it is being done. A notable recent example is the creation of the National Dairy Research Laboratories, at whose dedication last June in Long Island, New York, it was emphasized that the prime qualification of the modern research director is that he should be a team leader. There is, of course, the corollary that the units of the team should be willing to submerge their stellar ambitions to the objectives of the team.

* Paper presented before the annual meeting of the California Fertilizer Association, Coronado Beach Hotel, November 2, 1950.

Progress of Agricultural Science

The agricultural sciences have progressed steadily, but slowly, it seems, when compared with the spectacular pace of some of the other sciences. It usually takes many years of patient experimentation in plant and animal breeding, in soil and fertilizer problems, and related phases of agriculture to reach some definite conclusion. Many times brilliant successes go unheralded. For example, three-quarters of a century ago Mendel, experimenting with peas in his cloister garden, discovered the fundamental law of heredity. The great science of genetics thus humbly born has since blossomed into one of the glories of the scientific world and is now related to all the natural and the social sciences. That obscure peasant's work was forgotten for years simply because in his day means of communicating his discovery to the world did not exist. But today's agriculture is reaping the reward: genetics enables it to produce better strains of cattle, poultry, grain, fiber and food crops. Similarly with the work on corn hybrids initiated by Dr. D. F. Jones at the New Haven, Connecticut Agricultural Experiment Station. Dr. Jones worked quietly and unnoticed on his marvellous studies. No dramatic notice of his results was broadcast. But within fifteen years hybrid corn has almost completely supplanted open-pollinated corn in all commercial areas of the country. And what an unexpected impact this plant breeding research has had on the nation's fertilizer industry; as I shall show later on.

Fertilizer Research

Let me try to show how research more specifically affects us, you and me, in the fertilizer industry. Although the progress of agricultural research may seem like a snail's pace, over a long period of time it can and does effect profound, evolutionary changes. Briefly, I can illustrate as follows:

Before 1925 such a thing as a synthetic ammonia solution in the industry was unknown. By 1949 more than a third of the nitrogen used in the formulation of mixed fertilizers came from this one source. The trend in the use of these ammonia solutions is upward because of their suitability and lower cost per unit of nitrogen. About 1900 nearly 90 per cent of the nitrogen used by the industry in mixed fertilizers came from organic sources. Today, less than 5 per cent is derived from organics.

Before 1920 we were almost completely dependent upon foreign sources for our supplies of potash. By 1940 our domestic potash industry had so developed its techniques and capacities that we had become self-sufficient.

Before the recent war ammonium nitrate was unknown in the fertilizer materials trade; last year over 300,000 tons were used for agricultural purposes, of which a considerable amount went into fertilizer formulations. Urea is another newcomer to the synthetic sources of nitrogen materials.

In the field of phosphatic fertilizers significant improvements can be reported in both the mining and processing phases. The development of furnace processes may introduce some new, high-analysis phosphates, some of which are well-known here on the Pacific Coast. These materials may not prove suitable for use in mixed fertilizers because of their highly alkaline properties; but, undoubtedly, will find a place on the farm for direct application. Such are some of the advances of applied chemical engineering to the raw materials of the industry.

Centennial Year

This year we are celebrating the 100th anniversary of the birth of compound fertilizers which occurred in my home city of Baltimore, Maryland. Many units of the industry have advanced steadily, if slowly, from a wheelbarrow and shovel, manual-labor stage to highly developed, chemical - engineered completely mechanized entities of the great American chemical industry. Last year more than 18 million tons of commercial fertilizers were distributed in this country, of which about 13 million tons represented mixed fertilizers. The various materials-handling operations to produce this huge quantity, such as loading, unloading, movement to and from storage areas and base piles, had to handle pretty close to 100 million tons of materials. And this does not include the huge tonnage handled in the production of the nitrogen compounds, the superphosphates and the potash salts. The colossal size of these operations to produce one year's fertilizer tonnage in our country alone is not generally appreciated. The progress in these mechanical developments is truly extraordinary.

Yet in the essential job of merchandising our products I wonder if we are making corresponding progress. Are we doing what so many other modern industries are doing to improve selling techniques? Are we as an industry taking the necessary steps to organize sales staffs to carry out effective merchandising policies? Shouldn't we be training well-selected men to be service men, not order-takers, for that period immediately ahead in which new sales approaches and techniques will be demanded to correspond to the improved, changed conditions on the farm and in the fertilizer works? I am glad to acknowledge that this Association recognizes the need and is taking the lead to do something to improve sales techniques. More power to you! May your example spread eastward across the entire country!

Fertilizer Consumption Increases

A look at the latest statistics on fertilizer consumption in comparison with the pre-war record excites amazement: the increase in this State and nation-wise is enormous. We may be excused for feeling proud at this sharply-upward trend. Our industry's production record achieved during the war period under very serious handicaps was truly remarkable. But before we take too much credit for it all, let us look a little closer. A study of the factors behind the sharp increase in consumption reveals some hidden influences which should be known and appreciated because they are still operative. Knowing what they are, we can perhaps the more intelligently turn them to our advantage in the future.

It is clear to me that one of the most important single factors inducing this increase in consumption was the plant breeder. He is one of the research team previously mentioned. He, perhaps more than the fertilizer industry itself, created the new demand. For by giving us hybrid corn, Clinton oats, higher-yielding varieties of fruit, fiber and vegetable crops, the plant breeder expanded the field for our product. Hybrid corn has added about one billion bushels of corn annually to the commercial crop. To produce this additional yield it has been extimated that it required in terms of plant food more than 600,000 tons of nitrogen, 200,000 tons of phosphoric acid (P_2O_5), and 400,000 tons of potash (K_2O)—these plant foods equivalent roughly to about 5,000,000 tons of a 12-4-8 grade of complete fertilizer. Although not all this plant food was actually supplied by the industry, a large proportion of it was. The increased consumption of fertilizers in the Corn Belt since the late 1930's represents largely the demand created by these new, heavier-feeding, higher-yielding hybrids developed by the plant breeder. In the Gulf and South Atlantic States they are creating new breeds of cattle by crossing Indian Brahmin with native stock. This, plus the introduction of more effective chemicals to control animal parasites, and new species and varieties of grasses and legumes, has stimulated a demand for higher-yielding pastures throughout the Southland. Parallel with this have come new opportunities for the use of commercial plant foods where hardly any was used before. Applications of 1,000 pounds per acre per year of fertilizer on these grasslands is becoming a common practice.

These developments illustrate the result of the indirect approach to create new situations through the research team, for the purpose of stimulating new outlets for fertilizer. Let research develop favorable conditions leading to a new agricultural industry, like the tung oil plantations in the Gulf States, or livestock in the Deep South, and the fertilizer industry benefits. This, I declare, although indirect, is one of the most practical ways by which our industry can expand the sale of fertilizers on a profitable basis—what I previously described as the industry's obligation to discover or breed new sales opportunities instead of trying to divide the business already existing.

Research Opportunities

Let us now consider a few specific needs. I confess I am not competent to discuss your local problems and needs. The Pacific Coast region is so vast in area, so complex in soil, crop and climatic relationships, with everything done here on so massive a scale—it would be presumptuous of me to deal with anything but generalities. Despite your peculiar conditions, you do share many problems with your colleagues in the rest of the country.

Fertilizer usage is a comparatively recent development in this region. Undoubredly, lack of dependable information on many phases of soil-crop-fertilizer relationships has been in the past a deterrent to the more general use of commercial plant foods. Here as elsewhere, the farmer has first to be convinced that the use of our products will definitely be profitable under average conditions. Our job is to find out how and where to use plant foods to insure a profitable return. Under your conditions that is not going to be easy; and unless the industry learns to work closely as a unit in that broad research team I referred to previously, the task will remain most difficult.

The forces of research and education now at work here promise to be the most effective means of establishing fertilizer usage on an ever expanding basis. You have many competent, loyal workers in your local industry, who, by cooperating with State and Federal agricultural research and educational agencies, have already brought advantages to your interests. These men inform me that the next decade will witness a continued increase in fertilizer consumption throughout the Pacific Region. Fertilizing pastures here as elsewhere is a challenge to us. Cotton is now a major crop in this State, but a great deal more knowledge is needed about how and when fertilizer should be used on it for most profitable returns. Irrigation is being tried on pastures and, where supplemented with fertilizer, the practice should certainly pay well.

Although the sharp increase in population in this region in the past decade has created a large local consuming market, you are still dependent upon the eastern markets to take most of your specialized crops. Those distant markets have been captured and kept because you maintained dependable quality. As your soils become depleted, the use of chemical fertilizers will become one of the most effective methods to ensure yields and quality and therefore profits. The magnitude and diversity of California agriculture always amazes the agricultural visitor from the eastern half of the country; but what surprises him even more is the relatively small consumption of commercial fertilizers. I believe this disparity will, in time, be substantially reduced through the effective research and development of this Association and its individual members and the State agencies.

Service to Farmers

It seems to me one of the essential tasks facing our industry everywhere is to use, more and more, men who have been trained to give competent service. Somehow we must reach the farmer, the ultimate consumer, and particularly the farmer who does not attend the big meetings, does not visit the local agricultural station, and who seldom, if ever, sees and talks to our industry men about the use of fertilizer on his farm.

Generally, farmers know what they want, or think they do. No different from you or me. They know they should increase the productivity of their land, fill in the gullies, stop erosion and maintain rainfall or water on the land. Also, like you and me, farmers do not like to change their habits or ways of doing things. The many farmers who receive experiment station or

(*Continued on page 24*)

How Centralized Soil Testing Service Will Insure

COMPLETE MINERAL SOIL FERTILITY*

By K. STARR CHESTER

**Supervisor of Agricultural Research,
Battelle Memorial Institute,
Columbus, Ohio**

THE PROBLEM I have to discuss is one of the greatest moment to society and to the agriculture on which it depends—restoring and maintaining the fertility of soil. It is a problem that concerns us all, since our health, even our survival in a free world, rests on the most fundamental physical need of man—adequate nutrition, and this can be ours only if it stems from fertile and productive soil.

It is a problem that reaches far beyond the limits of any single science. Its solution requires the teamwork of men trained in soil science, geology, plant physiology and pathology, and animal and human nutrition. The suggestions I have to offer you represent the combined thinking of reputable scientists in all these fields, each contributing toward solution of the common problem.

My position in this problem is that of an administrator of research who has been privileged to share in this group study, and who can report to you a feasible plan, endorsed by many leading agricultural and medical scientists, for meeting and overcoming the problem of declining soil fertility.

What do we mean by complete soil fertility? To be completely fertile, soil should contain all of the minerals that are needed to enable plants to grow normally and become foods and feeds of high nutritional quality. There are other factors in soil fertility such as water supply, texture, and content of organic matter and microscopic life. This discussion is limited to mineral fertility.

As has been so well pointed out by Professor Truog, besides oxygen, carbon, and hydrogen, which plants secure from air and water, and the major soil nutrients, nitrogen, potassium, and phosphorus, plants, for normal growth, must also have much smaller amounts of the so-called trace or minor essential nutrients such as boron, copper, iron, magnesium, manganese, molybdenum, and zinc. Animals require most of these and also must have cobalt, iodine, and fluorine. Undoubtedly we will learn in the future of others which are essential though in very small amounts.

Minerals and Animal Health

If there is an acute deficiency of one or more of these, crops and livestock show definite symptoms of disease and may die. Minor element deficiencies produce many well-known disease conditions in both plants and animals. More sinister are the cases in which the deficiency is great enough to retard growth or normal development without producing clear-cut disease symptoms. Many times crops, animals, or humans may be regarded as in normal health when actually they are not growing and developing as fully as they might because their growth is limited by a partial lack of one or more of the necessary elements.

The safest, surest way for animals and humans to get these needed elements is through foods. But foods cannot contain minerals that are not present in soil.

Many of our soils are deficient in some of the necessary elements for geological reasons — the elements have never been adequately present. In many other cases the soils originally contained adequate supplies of all needed elements, but some of these have been lost through erosion, and continued cropping with a failure to return the removed nutrients to the soil.

There are areas of such acute mineral deficiencies that crops and livestock cannot be grown until the needed elements are restored, as in parts of Florida and California. Much more widespread are the areas of subclinical soil deficiency where fair growth is obtained and where deficiencies may not be suspected but where complete fertilization results in increased vigor of growth.

How Fertilizers Help

What can restoration of soil fertility mean to agriculture? First, it means greater production and with it greater income for the farmer. The Borders Farm in Kentucky, Louis Bromfield's Malabar Farm in Ohio, and many others over the United States where a program of complete fertilization has been adopted, show the abundant increases in yields over those which had formerly been considered normal for the areas.

As an example, in one of the rich vegetable areas of California, a farm manager applied to part of his celery a zinc spray in the expectation of controlling leaf disease. As the disease did not develop, the results can be explained as the effect of zinc as a plant nutrient. Although the untreated celery was prime in appearance, the sprayed celery was several inches taller, of a richer green color, and had a better flavor. In this case, no mineral deficiency had ever been suspected.

Complete fertilization can also restore to agriculture, lands that are now regarded as unsuitable for

*Address at Ninth Annual Institute, Conservation, Nutrition, and Health. "Friends of the Land"—Chicago, July 6, 1950.

cropping. A most striking example is the 90-mile desert in Australia which is a desert only because of a lack of copper and zinc. These are now being applied and the desert is being transformed into good agricultural land.

The farmer also profits in securing more nutritious crops which in turn mean better livestock.

But more important, is what complete fertility can mean to society. This morning 50,000 more breakfasts were served in the world than yesterday, 6,000 more in the United States. Day after day this increase in population continues at the rate of 20,000,000 more people in the world each year. Our amount of arable land is shrinking. A more productive soil could support this increase in population for many years to come.

Better Nutritive Value

But we need more than mere increase in the quantity of food. Too often intensified agriculture has increased yields while at the same time the nutritive quality of these has decreased. As an example, the introduction of hybrid corn has increased American corn production by 750,000,000 bushels per year. At the same time the protein content of this has so dropped that that it requires all of the protein in the American hybrid corn crop plus all of the protein in the American soybean crop to give us the same total amount of protein that we originally obtained from the smaller crop of open-pollinated corn.

Despite artificial fortification of our foods, their nutritive value is on the down grade due to losses of nutrients associated with processing of foods, their being transported for long distances, and especially to our declining soil fertility. We now recognize that malnutrition is a major factor in the degenerative diseases which are on the increase. The large number of rejections of young men in the enlistment of military men in World War II gives further evidence of a general lack of adequate nutrition among our people.

This brings us face to face with the heart of the problem. Our heritage of fertile soil, on which our health and even our survival depends, has been slipping away from us. We have a most solemn obligation that this be checked and that the fertility of our soil be restored and maintained. How can we achieve this?

Soil Analysis Vital

Before soil deficiencies can be corrected, we must know what and where they are. Only then can we devise and follow a rational practice of restoring the needed elements of fertility.

Every farmer has the means of knowing the needs of his soil for the major nutrients, nitrogen, phosphorus, potassium, and lime. Here in Illinois, for example, under the leadership of Dr. Roger Bray, some seventy county laboratories are analyzing 250,000 samples of soil per year to determine needs for potassium, phosphorus, and lime.

In contrast there is nowhere available to farmers the means for complete soil and crop analysis at a cost that can be easily afforded. A few states have the expensive facilities necessary for complete analysis, but these can be used for research purposes only. There are also a few commercial testing laboratories that offer more or less complete soil and crop analysis, but at present, this is at a cost too high to permit general use.

We cannot achieve widespread restoration of complete soil fertility until there is available to every farmer, at low cost, the means for knowing all the needs of his soil, not just nitrogen, potash, and phosphorus but also the boron, copper, zinc, manganese, and the other vitally essential minerals. The farmer must know the quantities of these that may be present or needed and the extent to which the minerals present in his soil are in a form that plants can make use of them.

A Comprehensive Plan

I want to propose a plan by which this essential service can be supplied, at a cost within the reach of every farmer, on a sufficiently broad scale, and established through the processes of American free enterprise. I repeat that this is not my idea alone but is due to the com bined study of many authorities.

The consensus is that there b established a central laborator serving farmers, nutritionists, an agricultural scientists throughou the nation with complete, quantita tive analysis of soils and their prod ucts. The cost of equipping an staffing such a laboratory would b too great to justify having many them. In the central laboratory th American industrial principle of lin production could be applied to ana ysis with high efficiency in the us of facilities, accuracy, and low co because of large volume.

How would this work out i practice? As an example, let u suppose a farmer has learned of th possibility that his land may nee correction of mineral deficiencies Perhaps he has learned of the good results obtained by a neighbor i complete fertilization.

He talks over his problem with his usual farm advisor who may be his county agent, local soil conserva tion agent, farm manager, or experi ment station scientist. Together they decide to have analyses mad

Samples of soil and crops a taken, under the supervision of th farm advisor, in standard fashio and sent to the laboratory. Withi a month the analyses are returned expressed in terms that the farme and his advisor can understand The laboratory makes no recom mendation on fertilizer practice bu the farm advisor has all availabl information on what results hav been obtained in similar cases.

Together the farmer and his a visor decide on fertilizer applica tions. If the practice of complet soil analysis and correction of al deficiencies is new in the community fertilizer trials would be set up o a small-scale experimental basis Later, as local experience broadens the local recommendations could b applied more widely.

The farmer and his advisor woul observe and measure differences i growth of the treated and untreate crops and would be encouraged send crop samples into the labor tory for nutritional analysis.

Let me emphasize that the labor tory would make no recommenda tions to farmers. This can only b

done by the local farm advisor on the basis of his local experience.

I visualize the laboratory as having the same relationship to the farmer and his farm advisor as the clinical laboratories, serving the medical profession, have to you and your family doctor. When you visit your doctor, he may take a sample of your body fluids and send it to a clinical laboratory for analysis. The results are returned to the doctor, and with this added information he can make a much better diagnosis of your case and recommendations for your treatment than he could without this information, supplied by the clinical laboratory in the background.

Coordinated Soil Service

What benefits may be expected of such an analytical service?

To the individual farmer it means an opportunity for substantially increasing the productivity of his land, the quality of his produce, and his social condition.

To the medical doctor it can provide a means for mineral analysis of human body fluid and tissue samples such as is not now available to him.

As the number of analyses grows, it can lead to the mapping of mineral-deficient areas to aid in their correction on a regional basis and to assist the mineral fertilizer suppliers in furnishing needed materials to those areas where they are most required.

Undoubtedly these many analyses of soils and plants would result in the discovery of new principles relating soil fertility to crop production and nutritive value.

It is quite possible that the analyses may lead to the discovery of new mineral resources since soils reflect the presence of mineral deposits. This could have important significance to our national security and prosperity.

It is quite probable that the laboratory would be called upon to serve other free nations. I have been asked by members of the United Nations Food and Agriculture Organization and by industrialists who are interested in foreign commerce whether such service could be applied to foreign samples. I think this is entirely possible and that it would be an excellent example of the philosophy behind Mr. Truman's Point Four.

Certain questions frequently arise when technical men discuss this proposed service. I would like to bring up some of these questions and indicate how they may be answered.

It is not enough to know the total supply of any given mineral in the soil. We must know how much of this total is available to plant roots. How may this availability be determined?

While there are methods to extract soil modeled after our concept of the ability of plant roots to take up nutrients, these are not always reliable. The best conceivable measure of availability of soil minerals is the plant itself. It takes up what is available. It follows that an analysis of a soil and of a crop growing on that soil can answer the two important questions of the total amount of minerals that will become available to plants over the years and the amount that is now available. Farmers are to be encouraged to send in such pairs of samples.

Start Now

Do we know enough about interpreting the results of complete analysis to be able to put this into rational practice? We probably will never know the complete interpretation of any soil analysis. For many years our farmers have been following successful programs of fertilization with nitrogen, potash, and phosphorus, on the basis of analyses for these, but even today we are learning new facts about interpreting these analyses. If we wait until we are completely informed on soil nutrient relationships we will probably never have the benefit of an analytical service. I believe the pattern to be followed is the same one that has been followed successfully with the major element analyses. The interpretation will grow with experience and practice, and if each locality starts on a trial basis, it will be on safe ground.

Another question is whether there is danger of applying too much of these minerals to the point that they may be harmful to plants. There is such a danger, but the farmer uses many other more dangerous chemicals with safety. There should be no harm from this source provided applications are made at conservative levels.

Can the fertilizer companies furnish the needed mixtures of major and minor elements? The best answer to this is actual experience in Florida where the fertilizer companies have adapted themselves to the need for complete fertilizers and are already providing these on a broad scale. As many as two hundred fertilizer-mixing plants are now producing such mixtures. If this is workable in Florida, it should be equally workable anywhere in the United States.

Finally, the question is sometimes asked whether the supply of the trace elements is adequate to supply our national needs. Surely it is for the near future. If in the distant future this is a problem, we can always turn to the sea as a practically limitless source of the needed minerals. The possibility of using atomic power for recovering pure water and minerals from sea water is considered as a reasonable peacetime use of atomic energy.

Laboratory Set-up

Now let us look at the laboratory itself. This would operate as a production line organization with each sample moving from step to step progressively, each step in the analysis being performed by a specialist trained for that particular function. Such a laboratory should be able to operate 24 hours a day if necessary. It should have the best in modern equipment and personnel. Among the needed instruments is the quantometer, the most modern type of automatically recording spectrograph which in less than two minutes of operation can give quantitative measurements, in parts per million, of up to 28 different elements including most of those having significance in nutrition.

I believe that the methods to be followed and other technical details should be decided by an advisory

(*Continued on page 26*)

Kansas Fertilizer Conference

Members of the fertilizer industry doing business in Kansas were guests of the Department of Agronomy of Kansas State College, December 7 and 8. Dr. H. E. Myers and his capable and energetic staff reviewed current research dealing with fertilizers. Their latest findings on experiments with wheat, corn or sorghum, alfalfa and red clover were emphasized particularly.

On the basis of their research, the following recommendations were made: (All per acre basis) *Wheat.* Drill 150 to 200 pounds of 0–20–0 or 65 to 90 pounds 0–45–0 with the seed, plus 60 to 120 pounds of ammonium nitrate or equivalent either at planting or as a top dressing anytime until March 15. *Corn or Sorghum.* Put down at planting 100 to 150 pounds of 0–20–0 or 40 to 60 pounds of 0–45–0, plus 100 to 200 pounds of ammonium nitrate or its equivalent at time of planting or as a side dressing at first or second cultivation. If the soil is deficient in potash, use 0–20–20 or 0–14–7 instead of 0–20–0 or 0–45–0. *Alfalfa.* On land high in potash, drill or broadcast, just prior to seeding, 200 pounds 0–20–0 or 90 pounds 0–45–0. On land low in potash, use 285 pounds of 0–14–7. *Red Clover.* Drill with the small grain seeding 200 pounds of 0–20–0 or 90 pounds of 0–45–0 where phosphorus alone is needed, or use 200 pounds of 0–20–20 or 0–20–10 or 285 pounds of 0–14–7 where both phosphorus and potash are needed.

M. H. McVickar, chief agronomist of the National Fertilizer Association, discussed the use of aircraft in applying fertilizer. Dr. McVickar pointed out that the airplane could sometimes be used to advantage in putting down fertilizer at the proper time when weather conditions make it impossible to do the job with ground equipment

At the banquet, the guest speaker, Kenneth A. Spencer, president of Spencer Chemical Company, ably described how nitrogen producers take coal or natural gas and produce valuable agricultural nitrogen. With expensive equipment and complicated processes, a final product is manufactured having a value many times that of the initial raw materials. Mr. Spencer went further and stressed that, under efficient plant management and judicious agricultural use, nitrogen benefits our whole economy—the producer, the farmer, those employed in the plant, those engaged in transportation and, of course, the public by providing more and better food at lower prices.

In summarizing the conference, Dr. Myers stressed the wisdom of increasing production through judicious fertilization rather than purchasing more land. He pointed out that the price of fertilizer was relatively low compared to the relatively high prices received by farmers for their products.

Contractors Named for New International Plant

J. R. Murphy & Co., Fort Worth, has been named general contractor for the chemical fertilizer plant to be constructed in North Fort Worth by International Minerals & Chemical Corporation, according to Maurice H. Lockwood, vice president in charge of the corporation's Plant Food Division.

Equipment for the plant will be furnished by A. J. Sackett & Sons of Baltimore; Sturtevant Mill Company of Boston will supply equipment for the superphosphate plant; steel work will be supplied by Mosher Steel Company of Dallas; and the conveyor system will be installed by Barber-Greene of Aurora, Ill., Mr. Lockwood also announced.

Commercial Solvents to Handle French Ethyl Alcohol

Commercial Solvents Corporation has been named as agent for the Reconstruction Finance Corporation to expedite the movement from France to the United States of approximately 106,000,000 gallons of ethyl alcohol. Delivery is to be made during 1951.

Arrangements to purchase this material by the United States Government from the Government of France were completed in October. This alcohol will be used in the manufacture of butadiene to meet the demands of the accelerated synthetic rubber program.

With the cooperation of the shipping industry and the Government of France, spokesmen for Commercial Solvents expressed confidence commitments will be met.

Consolidated Mining to Expand Plant Facilities

R. E. Stavert, president of The Consolidated Mining and Smelting Company of Canada, Limited, has announced construction projects amounting to a total of $ 5,000,000 to be undertaken by his company.

The company has decided to increase its fertilizer production by building a plant at Kimberley, B.C., with a capacity of about 70,000 tons per year of ammonium phosphate at a cost estimated at approximately $9,000,000. The new plant will include a unit for the treatment of tailings from the company's Sullivan mine to produce about 300 tons per day of sulphuric acid which will be used for the treatment of phosphate rock from the company's mines in Montana.

At Trail, the company will build an addition to its electrolytic zinc refinery at an estimated cost of about $3,200,000. This new unit will increase the production of refined zinc by about 70 tons per day and will use 15,000 h.p. of electrical energy. The extra plant capacity is required to treat the increasing quantity of zinc ores and concentrates which are becoming available from numerous mining operations in British Columbia, as well as the zinc which will be available from the Bluebell mine on Kootenay Lake and other properties owned by the company which are now being prepared for production.

In order to provide for the increased power requirements at Kimberley, the company has decided to build a high-voltage transmission line from its hydro-electric plant on the Kootenay River, a distance of about 87 miles. The cost of this line is estimated at $2,850,000.

Chemical Fertilizers Defended in Congressional Committee Hearing

THE FERTILIZER INDUSTRY was given the opportunity to defend its manufacturing methods and choice of materials at hearings of the Committee of the House of Representatives (known as the Delaney Committee) when the committee resumed sessions early in December. The committee was appointed to investigate the effects on health and nutritional value by the use of chemicals in the production of foods, and included in its scope was the subject of chemical fertilizers. Hearings have already been held in Chicago at which food manufacturers presented their testimony and on December 5th the fertilizer industry was given the chance to present their side of the controversy. We are indebted to *Fertilizer News* published by the National Fertilizer Association, for a summary of the testimony at the present hearings.

Dr. Russell Coleman

In his testimony on December 5, NFA's President Coleman stated that every State has adequate fertilizer control laws to protect the public, that there is no evidence of any kind to indicate that commercial fertilizers used in the growing of plants and crops have ever been harmful to animal or man, and that there is an abundance of factual data proving that fertilizer use has brought genuine, lasting benefits to America and its people.

Commercial fertilizers, Dr. Coleman declared, are such an essential part of our national economy that, according to the U. S. Department of Agriculture, they account for more than 20 per cent of our farm production. "Without commercial fertilizers," he said, "it would be impossible to provide our present population with the quality and quantity of food which it has today," unless we found another 50 million acres of productive land and the farm labor and machinery to work them. This would mean, said Dr. Coleman, higher production costs, less farm income and less labor available to industry. Furthermore, he added, 50 million additional acres of productive land are not to be had.

He characterized statements condemning chemical sources of plant food as "completely unsupported by any scientific data," and labelled claims to the effect that certain diseases are becoming more prevalent with increased use of chemical fertilizers as absolutely without basis. "It might be argued," he said "that the increase in life expectancy in this country during the past 50 years is due to the fact that the use of fertilizer during that time has been increased by 650 per cent. . . . It might also be pointed out . . . that the average length of life in India, a country where very little commercial fertilizer has ever been used, is about 28 years."

Dr. Coleman compared the rantings of organic cultists whose mythology tries to make "chemical" a scare word and "natural" a virtuous concept, with those of the old witch doctors who would shun the use of such chemicals as atabrine, novocaine, aspirin and the sulfa drugs and would rely solely on such natural products as roots and herbs. He added that the commercial fertilizer industry, like modern medicine, does not overlook the valuable possibilities of natural products and recognizes their usefulness to agriculture. Commercial fertilizers are, in fact, themselves products of nature, he said, which are processed by man to make more readily available their essential plant nutrients. Man's discovery of ways to extract these precious essences from Nature's storehouses, he declared, marks one of the great advances of our civilization.

Dr. Ralph W. Cummings

Appearing on the same day, Ralph W. Cummings, director of research, North Carolina Agricultural Experiment Station, told the committee that "existing State fertilizer legislation is adequate to enforce correctness of labelling and otherwise protect the public." He also observed that the importance of chemical fertilizers in southern agriculture can be realized in part when we consider that few of the crops being cultivated in this area today could be grown successfully on more than a subsistence basis on many of our soils without the use of chemical fertilizers. Without them we would not have our tobacco industry, we could not grow cotton in much of the Southeastern area, we would have no citrus industry, no commercial vegetables. . . . In short, the Southeastern area of the country would not be able to support any important agricultural economy.

"Regardless of whether the soil is fertilized with organic or inorganic fertilizers," he continued, "the elements used by plants and absorbed by their roots are taken up in the same forms . . . and experimental work shows that it is possible to supply the balanced needs of the crops more precisely, more completely, more economically and more efficiently by the wise use of chemical fertilizers . . . than is possible by the indirect organic route. Also, . . . the supply of organic materials . . . would supply only a small fraction of the plant food needs now being met by chemical fertilizers."

There is overwhelming evidence, declared Dr. Cummings, that far from being harmful, chemical fertilizers have made possible a raising of nutritional standards. After presenting specific evidence based on research conducted at the North Carolina Station to the effect that fertilizer use causes spectacular increases in yield and improvement in quality of various crops, he expressed the opinion that chemical fertilizers are an "entirely indispensable" part of our economy and

(*Continued on page 24*)

Insecticides to Replace DDT Now Sought by Researchers

Although DDT has saved thousands of dollars by reducing orchard injury by some insects, it has also killed off the predators of others. The net result has been that while some insects are on the way out, others show signs of increasing.

That explains why the search is on for new insecticides that may be used with, or in place, of DDT. W. S. Hough, entomologist at the Winchester Research Laboratory, says that outbreaks of many pests may follow or accompany the use of DDT. Red-banded leaf rollers, mites, Forbes scale, and plum curculio fall into this classification.

The remarkable effectiveness of DDT apparently is limited to certain pests only. On apples it has proved effective against codling moth and leafhoppers; and on peach trees against oriental fruit moth and peach tree borer.

So far, in their search for time-saving combination sprays, researchers have found that when Dimite, 341-C (a fungicide for disease control) and DDT were used together, the toxicity of DDT was considerably reduced. Toxicity of DDT apparently was not affected when it was used in a two-way combination spray with such fungicides as ferbam, phygon, TAG 331, puratized apple spray, manzate, 341-C, and cop-o-sink.

Parathion seems to lead the list as a possible substitute for DDT. So now the compatability of parathion with other materials also is being tested, but no results are available as yet.

Fertilizers for Beans

The three most commonly used analyses of fertilizers on beans in New York are 5-10-5, 4-12-4, and 3-12-6. Very few farmers use over 400 pounds per acre; the average is about 300 pounds. This may be sufficient on land heavily fertilized the previous year, on a good legume sod, and on land heavily manured. However, on soil of low fertility, deficient in organic matter, and on land previously in old sod or small grain, tests indicate that more fertilizer is justified.

Field tests have generally shown that broadcasting before plowing gives better results than broadcasting after plowing. It is never safe to apply fertilizer through the same spout with the seed.

Texas Sales of Fertilizers

Distribution of sales of principal fertilizers in Texas, by grades or materials, from January 1, through June 30, 1950 totaled 336,621 tons as compared to 300,785 tons for the same period during 1949. This amounts to a 12 per cent increase. The accompanying compilation shows the amount used both as to ratios and to materials. Sulphur was omitted from the detailed tabulation. Practically all of the 2,258 tons sold was used in counties along the Rio Grande. Only limited tonnages of several grades were sold and these are not covered in the table. In other cases, certain products had to be grouped to avoid release of information concerning the business done by individual companies.

TONNAGES OF FERTILIZERS SOLD IN TEXAS JAN. 1–JUNE 30, 1950

	1950	*1949*	*Relative 1949=100*
Mixed goods	210,133	197,474	106
0–14–7	10,494	1,863	563
4–8–8	6,513	5,901	110
4–12–4	51,277	75,079	68
5–10–5	116,028	103,810	112
6–10–4	8,505	1,659	513
7–14–0 (6–12–0)	1,330	1,893	70
8–8–8	6,742	3,307	204
10–10–0	1,204	875	138
10–20–10	3,362	333	1,010
Materials	126,488	103,311	122
Ammonium nitrate	12,633	5,925	213
Nitrate of soda	1,517	1,437	106
Sulfate of ammonia	4,290	1,142	376
Ammonium phosphates	34,262	20,956	163
Superphosphate, normal	44,395	56,181	79
Superphosphate, concentrated	13,494	2,474	545
Phosphates, unacidulated	8,487	8,052	105
Sulphur	2,258	1,531	147
Constituents			
Nitrogen	22,241	15,407	144
Available phosphoric acid	39,416	37,784	104
Potash	9,027	9,369	96

FERTILIZER MATERIALS MARKET

NEW YORK

Advance in Sulphate of Ammonia and Ammonium Nitrate Prices. Sales of Foreign Organic Materials Increasing. Superphosphate Prices Increasing. European Potash Arriving.

NEW YORK, December 20, 1950

Sulphate of Ammonia

Prices were recently advanced $8.00 per ton by some of the leading coke oven producers in the midwest, making the new prices $40.00 to $45.00 per ton in bulk, f.o.b. production point, according to location. Most producers were sold out.

Nitrate of Soda

Little change was heard in this material except that movement had picked up recently.

Ammonium Nitrate

One large domestic producer recently advanced the price of this material and offerings were scarce and hard to locate. Most producers were behind on shipments.

Nitrogenous Tankage

Some imported material was offered at prices higher than the domestic market and some sales were made, as the buyers were unable to buy domestic material because the producers were sold out.

Castor Pomace

With a decrease in the production looked for during the first quarter of next year, sales were made on the basis of $5.50 per unit of ammonia ($6.68 per unit N) for prompt shipment, f.o.b. Eastern production points. Demand continued good.

Organics

Cottonseed meal showed outstanding strength in the organic fertilizer material markets with advances of about $4.00 per ton in the last week or so. Current prices quoted were around $80.00 per ton in bags for 41 per cent protein material at Memphis. Soybean meal remained firm at $61.00 per ton in bulk, f.o.b. Decatur, Ill. and there seemed to be more interest in linseed meal. Last prices were $62.50 per ton in bulk, f.o.b. Eastern shipping points. Tankage and blood showed little change in price, around $8.50 per unit of ammonia ($10.33 per unit N) f.o.b. Eastern shipping points. Feed buyers were showing more interest than fertilizer buyers.

Fish Meal

Unground menhaden fish scrap was in demand from some feed quarters and sales were made at $132.50 per ton, f.o.b. Baltimore. Prices asked for the ground menhaden fish meal were slightly higher. Imported fish meal continues to arrive in this country at various intervals.

Bone Meal

On account of some heavy recent arrivals of foreign material, the domestic market for feeding bone meal was rather spotty but fertilizer bone meal was moving freely and some producers have withdrawn from the market.

Hoof Meal

This market was rather nominal, due to lack of offerings, with last sales made at $7.25 ($8.82 per unit N), f.o.b. Chicago.

Superphosphate

This material was advanced in price at Baltimore to 81 cents per unit and sales were made on this basis. It is expected the price will be advanced at some other production points about six cents per unit about January 1st. Demand was good in all parts of the East. Triple still remains firm and hard to locate for prompt shipment.

Potash

Demand was better for this material and some of the recent arrivals of foreign muriate and sulphate of potash were said to be all sold out. Domestic producers are having trouble securing necessary box cars.

PHILADELPHIA

Tighter Situation in Most Materials. Sulphuric Acid Shortage Continues. Car Shortage Slows Potash Shipments.

PHILADELPHIA, December 20, 1950

The price position of the various raw materials is gradually tightening although there is as yet no exceptionally heavy demand. Sulphuric acid continues extremely scarce and this is having its effect on sulphate of ammonia and superphosphate. Very little resale material is on the market and buyers show scant interest unless the prices are fairly low. Organics, other than nitrogenous tankage, seem to be in ample supply.

Sulphate of Ammonia.—The price of coke-oven grade has been advanced $5.00 to $8.00 per ton but the supply seems to be keeping up quite well with contract requirements. Synthetic grade is very scarce.

Nitrate of Soda.—This article continues in a very good supply position and the situation is quite normal with no price changes reported.

Blood, Tankage, Bone.—The market in tankage and blood is rather quiet and supplies seem sufficient to meet requirements, with no significant price change. Bone meal is somewhat stronger and steamed bone is presently quoted at $65.00 to $67.50 per ton.

Castor Pomace.—This is more or less nominal at $5.50 per unit of ammonia ($6.68 per unit N), at producing plants.

Fish Scrap.—Market is quiet with limited inquiry. Scrap has been priced at $122.50 per ton, with

menhaden meal at $127.50 to $130.00.

Phosphate Rock.—Demand for deliveries on domestic contracts has slowed down as acidulators are not getting all the sulphuric acid they require.

Superphosphate.—The price of normal has been advanced to 81 cents per unit in the Baltimore area. Inventories are declining and the effect of the sulphuric acid shortage is now rather serious. Triple grade continues exceedingly scarce.

Potash.—Production of domestic has been at full capacity, but car shortages have become more frequent and deliveries are said in some cases to be more than a week behind schedule. This has necessitated storing some material awaiting shipping opportunity, and has revived interest in foreign goods.

CHARLESTON

Acid Shortage Causing Serious Superphosphate Situation. Prices Increased on Several Chemical Nitrogen Materials.

CHARLESTON, December 18, 1950

Of prime concern to fertilizer manufacturers is the situation on superphosphate which in general is now extremely tight. Producers in the Baltimore area recently found it necessary to increase the price five cents per unit on normal superphosphate and some have withdrawn from the market. Potash movement is being hampered by shortages of boxcars and the current railroad strike. All forms of nitrogen are tightening in supply and many of them have recently been increased in price.

Organics.—This market continues tight with the major nitrogenous tankage producers sold up. Prices for this type tankage nominally are $4.50 to $5.00 per unit of ammonia ($5.47 to $6.08 per unit N), in bulk f.o.b. origin. Blood and packing house tankage continue at levels that interest only the feed trade. Imported nitrogenous offerings are light and prices around $5.75 per unit of ammonia ($6.99 per unit N), in bags, ex vessel Atlantic Ports.

Castor Pomace.—Limited supplies are offered for fall shipment at $5.50 per unit of ammonia ($6.68 per unit N), in bags, f.o.b. Northeastern production points. This material is guaranteed 5.75 per cent minimum ammonia.

Dried Ground Blood.—Both the New York and Chicago markets are relatively quiet at levels of prices around $9.00 per unit of ammonia ($10.94 per unit N), in bulk.

Potash.—Production continues at capacity level with movement impaired occasionally by shortages of boxcars. In some instances the tie-up has been serious.

Ground Cotton Bur Ash.—Limited supplies are available for spring shipment from Texas, representing considerably less than the quantity available last season. This material is in ground form and tests 30 to 40 per cent K_2O.

Phosphate Rock—Domestic movement is entirely against contracts with increased Ocean Freight discouraging foreign sales. Some reduction in domestic movement has been noted, due to acidulators' inability to secure all their needs of sulphuric acid.

Superphosphate — Triple superphosphate is practically unobtainable except by buyers who have contract history. The demand is far in excess of supply. Normal superphosphate is also extremely tight with no surplus to be found in the entire Southeast. Supplies are also short in the Midwest and Far West.

Sulphate of Ammonia—A producer of synthetic material has recently announced an increase of $9.20 per ton effective in February on contracts. Some steel mills have announced an $8.00 per ton increase on new business, but practically no offerings are in the market.

Ammonium Nitrate.—This material continues far short of demand

and another domestic producer has recently announced increase in prices of $3.00 per ton.

Nitrate of Soda.—Supply position is comfortable and market well in balance. No changes in prices have been noted.

CHICAGO

Little Price Change in By-Product Organics Market. Action on Price Controls Awaited.

CHICAGO, December 18, 1950

The market on animal ammoniates in this area has continued without any major changes in price structure. Trading has been confined to limited quantities and nearby shipment only. There has been no aggressive demand and sellers have not been pushing their production very hard. These products, like other commodities, are more or less marking time, awaiting some more definite indications from the government as to price controls.

Ground and sacked meat scraps, 50 per cent protein, is nominally unchanged at $110.00 per ton with price discounts of $3.00 to $5.00 per ton being accepted in some areas. Digester tankage, ground and sacked, 60 per cent protein, is listed at $110.00 to $120.00 per ton depending upon location. These prices are also subject to discount in some territories. Dry rendered tankage advanced in price from $1.85 to $1.95 per unit of protein according to location. Wet rendered tankage is steady at $9.00 to $9.50 per unit of ammonia ($10.94 to $11.55 per unit N), and dried blood at $9.00 per unit ($10.94 per unit N). Steamed bone meal in bags, 65 per cent B.P.L., is listed at $75.00 to $80.00 per ton and raw bone meal, 4½–45 per cent, B.P.L., at $70.00 per ton.

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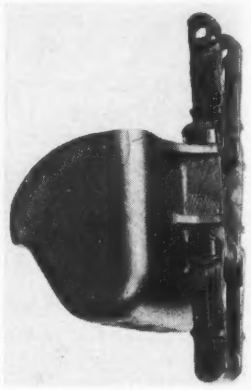
Cast integrally with a single link of chain, Beaumont Beaucalloy "Uni-Cast" Buckets annot loosen and fall off. Easy to replace, there are no raised surfaces or projecting bolt heads on inside of bucket to retard discharge of material. Made of Beaucalloy, a heat-treated alloy steel, the bucket is said to be exceptionally durable. The front edge and corners are reinforced to withstand abrasive action while loading. The bottom of the bucket is flat to prevent arching. They



Unicast Bucket

are made in five sizes, 8″ x 5″, 10″ x 6″, 12″ x 7″, 14″ x 7″, and 16″ x 8″. Other sizes can be furnished to meet requirements. Further information can be obtained from Beaumont Birch Co., 1505 Race St., Philadelphia 2, Pa.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Tyson Joins Barrett Sales Staff

The Barrett Division, Allied Chemical & Dye Corporation, announces the appointment of Robert M. Tyson to handle sales in northwest Georgia and eastern Tennessee of Direct Application Nitrogen Materials including "Arcadian" the

Robert M. Tyson

American Nitrate of Soda, "A-N-L" Brand Fertilizer Compound and other nitrogen materials distributed by Barrett for direct application.

Mr. Tyson, a native of Thomasville, Ala., attended Alabama Polytechnic Institute and Jacksonville State Teacher's College, Jacksonville, Alabama. He was formerly employed by U. S. Engineers and since 1944 has been in the hardware and farm implement business. Mr. Tyson and his family will continue to reside in Cartersville, Ga.

Arkell & Smiths Enlarge Canajoharie Plant Capacity

The completion of a $55,000 plant expansion program at the Canajoharie plant of Arkell & Smiths was announced recently by S. S. Yates, Chairman of the Board of Directors and President of the Canajoharie bag making company.

This step marks the final phase of a two-year expansion program in all three of the company's plants, Mr. Yates pointed out. The addition of the warehouse space and manufacturing area has made possible economies of operation and handling which had previously been impossible.

The installation of a high speed web specialty printing press in January will increase the specialty bag capacity of the Canajoharie plant by approximately 50 per cent, Mr. Yates added. This plant manufactures coffee bags, flour bags, dog food bags, insecticide bags, and multiwall bags for fertilizer, limestone, cement and chemicals.

Renovation Boosts Beltsville Pasture Yields

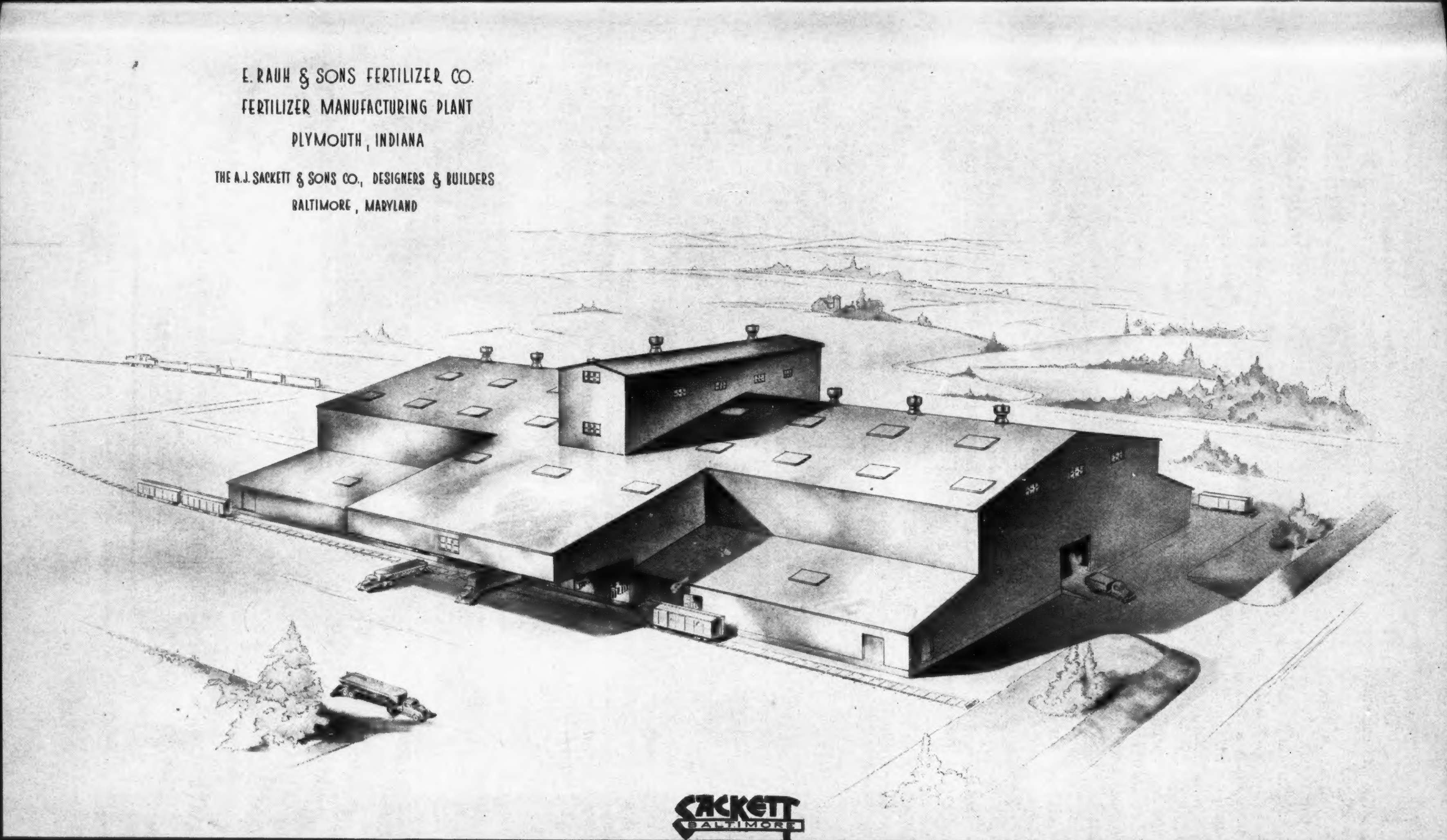
Renovation of old permanent dairy pastures at the Agricultural Research Center, Beltsville, Md., in 1945 resulted in an average yearly increase of 35 per cent in feed nutrients during the next 5 years, according to the U. S. Department of Agriculture.

"In other words," says J. B. Shepherd, dairy husbandman for the Bureau of Dairy Industry, "for the past 5 years our renovated pastures have had a potential milk-producing capacity of 35 per cent more than the unrenovated pastures with which they were compared in these experiments."

The renovated pastures not only provided more grazing than the unrenovated pastures, but they furnished more grazing earlier in the spring and later in the fall. Furthermore, from July 15 on, when permanent pastures are often short, the renovated pastures outyielded the unrenovated pastures by an average of 45 per cent each year for the 5 years.

Plant population counts were made each fall by agronomists of the Bureau of Plant Industry, Soils, and Agricultural Engineering, who cooperated in the renovation experiments. They found a progressive decrease in legume content and an increase in grass and weed content, so that in this respect the renovated pastures are now similar to the unrenovated pastures.

According to the agronomists, this shift from legumes to grasses lowers the protein content of the pasture herbage, and for this reason they conclude that renovation at Beltsville should be repeated soon after



the fourth year. This would prevent unfavorable changes in the botanical composition of the pasture and a dropping off in total yield.

To start the renovation experiments, several permanent, better-than-average pastures on tillable land were treated with manure and lime and then torn up with a heavily weighted disk harrow in the fall. The cut-up sod was left on the surface as a protection against erosion. Early the following spring 500 pounds per acre of an 0–14–14 fertilizer was broadcast, and the pastures were double disked, then harrowed again before being reseeded with a mixture of 8 pounds of bromegrass, 8 pounds of alfalfa, 3 pounds of red clover, and 2 pounds of Ladino clover per acre. The renovated pastures were cultipacked after seeding and received no other treatment during the 5-year period except for another 500 pounds of 0–14–14 fertilizer in the spring of the second year.

For comparison purposes, a part of each original pasture was not renovated, but received the same fertilizer treatment as the renovated pastures.

The average yield in pounds per acre of total digestible nutrients from the renovated pastures was: First year, 2,016 pounds; second year, 4,155 pounds; third year, 3,967 pounds; fourth year, 4,142 pounds; and the fifth year, 3,797 pounds. The 5-year average per-acre yield for the renovated pastures was 3,617 pounds of total digestible nutrients as compared with 2,687 pounds for the unrenovated pastures,—or an increase of 930 pounds of total digestible nutrients per year.

This increase, which amounted to 35 per cent, is equivalent to 1,860 pounds of good hay, and is about equal to the total production of feed nutrients from many pastures of low soil fertility.

Industry Calls For Early Orders

Farmers and growers are being urged to survey their 1951 requirements for insecticides, fungicides and related materials and to place an immediate order, by L. S. Hitchner, Executive Secretary, National Agricultural Chemicals Association.

"Since many of the raw materials required by industry are also necessary for defense production, growers should make their needs known as soon as possible so that industry will be able to more efficiently schedule plant operations," Mr. Hitchner said. In placing orders, growers should take into account the expanding needs for food and fibre crops as reflected in U. S. Department of Agriculture policy.

"Because of expected or existing shortages of many raw materials including chlorine, benzene, copper and lead," Mr. Hitchner said, "growers should be prepared to use alternate products in some instances."

Another problem facing the industry is a shortage of some types of transportation which can best be met by the early distribution of insecticides to strategic locations throughout the country possible only on the basis of immediate indication of needs by users.

Since not only increased production but efficient production will be of utmost importance next year, the industry urgently requested immediate appraisal and ordering.

Book Review

WOOD PRODUCTS FOR FERTILIZER. Paper; 53 pages. New Haven, Conn.: Northeastern Wood Utilization Council. $1.

Many observers of agricultural practices have from time to time expressed the view that agriculture could make good use of its wood wastes and weed wastes in the maintenance of soil fertility. In this publication (bulletin No. 32) the helpful Northeastern Wood Utilization Council tells what can be done in that direction.

The Northeastern states, and especially New England, have "wood to burn"; all too often it is burned—wastefully. It can be burned to local advantage, and in this booklet, Herbert A. Lunt, of the Connecticut Agricultural Experiment Station, tells about the utilization of wood ashes as fertilizer.

The fertilizer requirements of the Northeast are set out by J. A. Chucka, of the Maine Agricultural Experiment Station. How to contribute to those requirements by means of local materials—sawdust, shavings, waste bark, and lignin—is told by a number of agronomic experts. A bit of fundamental information is given in the chapter on the action of soil bacteria on wood products. There is a reflection of progress and potentialities in the discussions of lignin as a potato-fertilizer and a soil-builder.

Congressional Hearing

(*Continued from page 13*)

that their use is in the national interest.

Dr. Firman E. Bear

Pointing out that America's land must produce nearly 200 times as much as it did in the days when only 800,000 Indians inhabited the country, Firman E. Bear, chairman of Rutgers University's Soils Department, stated that soil elements removed in the harvesting of crops and lost in drainage water must be made good by the use of fertilizers.

By the use of fertilizer, he said, it is now possible to bring the most barren ground into a high state of productivity in a very short time, to maintain the producing capacity of fertile soils, and to raise the crop-producing powers of all soils to much higher levels. "Without their use," he declared, "the problem of adequately meeting the food needs of the world's more than two billion people is virtually insoluble."

He expressed the belief that plants grown with fertilizers are as good nutritionally as those grown with manures, and often better. Poisonous vegetation, on the other hand, is found over wide areas, he said, where neither manure nor fertilizers have ever been used.

"The fertilizer industry," Dr. Bear concluded, "represents the most important chemical advance in terms of human values that the world has ever known. Fertilizers stand between us and starvation for centuries to come," and ". . . most farmers would profit from using them in considerably larger amounts than they now do use them, especially on their better land . . . . This would be to the great advantage not only of farmers but of the Nation as a whole."

Professor Emil Truog

In his prepared statement Professor Emil Truog, chairman of University of Wisconsin's Department of Soils, declared that absolutely no authentic evidence exists to the effect that chemical fertilizers are injurious to soils. In fact, he said, an improvement in soil condition usually results from their use.

He urged that deposits of phosphate rock, potash salts, and sulfur should be conserved as far as feasible for posterity by making all possible use of sewage, garbage and organic waste materials for fertilizer purposes. "However, in this connection," he added, "it is important to recognize that if all of the readily available garbage and organic wastes produced in this country were turned into compost as proposed by the adherents of the 'organic school,' the total production would probably not provide more than 5 to 10 per cent of the fertilizer elements needed to keep our soils in a satisfactory state of production."

Service Through Research

(*Continued from page 8*)

extension service reports of field experiments, in the form of bulletins, pamphlets, and also fertilizer sales literature, usually receive these as a series of separate pieces of information, much of which may not be directly connected with their particular farm problems.

The avalanche of material can be very confusing. The individual farmer wants not only *more* good technical knowledge; but he wants to know *how* all these remedies, skills and conclusions can be unified so as to apply right on his own farm. Each of the experts at the Station has an extensive, largely generalized knowledge of farming problems. That knowledge has got to move to the individual farms. And the farmer himself is the only one who can apply all this available printed knowledge. The farmer as an individual does not want to be ordered to do a thing any more than you or I do. He, like us, wants to learn by *doing* on his own farm. The farmer will have to be taught perhaps to regard his farm as a unit operation, and not so many separate fields, a wood lot, a pasture, barn or meadow. Such is what an industrial plant manager has to do, that is, he has to plan, adjust, and readjust his whole operation to the needs of any radically new machine which management introduces.

It should be our purpose and that of the educational agencies of government to give the farmer a new viewpoint by which he regards his land and water, his work and life, as inseparable parts of the cycle of nature. In this way the farmer begins to realize that modern science can and does indeed affect his daily life and thus it all comes to have meaning for him.

Service through Research—Con't.–

Let us examine this situation further. It is remarkable how such cooperation will benefit not only the farmer but the fertilizer field representative and the scientist in his laboratory. Farmers are keen observers and when they are made to interest themselves in the use of plant nutrients on their land, their observations can be of great value in laboratory research and help to open new doors to more and more discoveries. By keeping a living channel of communication open between the layman and the laboratory, a needed stimulus is given to science, invention and industry.

Conclusion

I would like to conclude with these thoughts: The chief goals of our industry should be: to help the farmer do a better and more profitable job, morally as well as financially; to help the consuming public to get the maximum of enjoyment and health from the food it buys. The plant foods we supply agriculture are indispensable to the vigor and well-being of plants, livestock and man. We in the fertilizer industry serve the most basic need in the national economy. After all, what is more essential than an abundance of good, nourishing food? Let us stop being on the defensive against the criticisms of cultists and politically ambitious office holders. Our industry serves agriculture, the mother of all industries and the public health. We have a public relations problem. We have got to find effective means of telling the public, in a positive way, about the fundamentally important service we are rendering. And, more to the point, as an industry, as regional groups such as this Association, and as individuals, let our deeds speak louder than words.

Mineral Soil Fertility

(Continued from page 11)

council of our leading soils and nutrition specialists and that the laboratory itself should be headed by the most capable scientist in this field who can be found. The records of the laboratory, which would desirably have the form of punched cards containing all possibly useful data, could be made available to competent scientists for studies on the distribution of deficiencies and of minerals and any other legitimate use.

What kind of an organization could conduct such a laboratory? I believe it should have the following requirements. It should be experienced in industrial production methods. Its operation should be efficient with a high tempo and resultant economy. It should be experienced in handling a job of this magnitude which could conceivably reach one million samples per year or more. It should be experienced in all analytical methods and should Complete Mineral Soil, etc. (cont.) have a background in research and analysis in the field of agriculture, soils, and particularly the trace elements. It should have good working relations with the diverse interests which are involved: agriculture; the industries serving agriculture; governmental agencies; and the nutritional and medical professions. There should be no geographic limit to its operation. It should have a permanent structure and be free of political interference. Finally, it should have the point of view of conservation.

All of these requirements point to a large, independent, non-profit research institute with the special qualifications mentioned.

The Cost

What would such an undertaking cost and how might it be sponsored? Three independent estimates are in agreement that it would require $250,000 to establish this analytical service and carry it through the initial period until it becomes self-supporting. Thereafter, any surplus income should be applied to research on the soil-nutrition cycle. This amount represents one thousandth of the amount of money that has been recently spent in supporting the price of potatoes.

Should such a service be supported by government? While it falls within the province of government in that it is a service to the people at large, there would be certain disadvantages in having this operated as a governmental agency.

We recall the effects of changes of administration on such agencies and the inability of a governmental agency to operate with the same degree of efficiency as a private one. Personally, I am reluctant to turn to government for any service that we can perform ourselves.

There are many industries, organizations, and individuals who have the will to protect and restore our cradle of life, the soil. I am thinking of the industries that serve agriculture, providing it with fertilizers, farm equipment, seed, and petroleum, the mail-order houses, railroads, banks, and insurance companies, the processors and distributors of farm products, the farm organizations, the medical profession, and those private individuals with the means and will to put the principles of conservation into practice.

I have outlined to you what I believe is one of the most pressing problems in the field of our common interest in conservation, nutrition, and health. I have described a way of solving this problem which is scientifically sound and practical.

The cost of providing American agriculture with the knowledge to guide restoration of complete fertility of our soils is nominal, especially if this cost is divided among a number of sponsors.

I believe that the means for accomplishing this major forward step in conservation can and will be found—and soon.

Soil Gives 6-to-1 Return

If you follow good soil management, you can spend one dollar and get six in return, declares Jon Griffin, soil experimental field worker at the University of Illinois.

"This means you'll have to keep at least one-fourth of your land in legumes," he explains. "By spending $5.25 an acre for lime and phosphate, you can get about 30 extra bushels of corn, worth about $30. That's a six-to-one return."

For the last 4 years, the 25 College of Agriculture soils experiment fields scattered over the state have averaged 84 bushels of corn an acre. The state average for the same period was 55 bushels, or 29 bushels less.

And these fields have received only animal manure, green manure, and crop residues since 1924! Not one single pound of off-the-farm fertilizer for the last 25 years, and still they produce 84-bushel corn.

In 1948 the experimental fields averaged 100 bushels of corn an acre, while the state average was only 61 bushels—a 39-bushel difference. In 1949, soil experiment fields showed a 41-bushel advantage—96 bushels compared with 55 bushels for the state average.

"There's nothing mysterious or magic about growing 90- and 100-bushel corn," declares Griffin.

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If pride in achievement is justifiable, the Fertilizer Industry may feel justly proud of its long record of assistance to American agriculture. During its first century of existence great progress has been made.

The coming century presents a many sided challenge:

1. Increasing Populations.
2. Increasing Standards of Living.
3. Increasing Economic Problems.
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